

2d, 3d, 11th, 13th, 20th, 21st, 24th, 25th. On the 11th an ice-dam which had formed on the river broke, and resulted in the sinking of the steamer "Fort Smith," and caused other damage.

Little Rock, Arkansas: floating ice on 3d and 5th; ice-dam on 6th. The river was frozen from the 7th to 13th.

*Miscellaneous.*—Lynchburg, Virginia: ice on the streams in this vicinity was four inches thick on the 9th.

Brevard, Transylvania county, North Carolina: the creeks in this vicinity were frozen on the 6th.

#### FLOODS.

Ellicott City, Howard county, Maryland.—The heavy rain on the night of the 8-9th (during the passage of low area iv.), caused the streams throughout this county to rise to an unusual height for this season of the year. At Oakland Mills the water covered the roadway to a depth of four feet, rendering travel almost impossible and causing delay of mails. The bridge over the Middle Patuxent river is reported to have been carried away.

Red Bank, Monmouth county, New Jersey.—The freshet on the night of the 8-9th caused much damage to the bridges over the Shrewsbury river at this place. A stone pier of an iron bridge was swept away. Bridges were also carried away at Newman Springs, Swimming River, and Hart's Mills.

Fredericksburg, Virginia, 9th.—A destructive freshet has occurred in the Rappahannock river. Several thousand railroad ties, and much other property, was swept away from the wharves.

#### HIGH TIDES.

Narragansett Pier, Rhode Island.—The severe southeasterly storm of the 9th (low area iv.) caused very high tides, which resulted in serious damage along the sea front. From twenty to thirty large bathing houses were damaged to a more or less extent, and the McSparran hotel grounds and dock were almost completely washed away. The engine-house on Lucker's dock was also washed away and the wharf badly damaged. The sea broke over the banks in places from the mouth of Narragansett bay to Point Judith, causing great damage to roadways and fencing.

Point Judith, Rhode Island.—The heaviest surf and highest tide known here for several years occurred on the 9th (during low area iv.), causing much damage to fences, walls, and small boats.

New London, Connecticut.—The high tides of the 9th (during low area iv.) submerged the Shore Line railroad track, and caused numerous washouts. This road was built in 1853, and was never before submerged by high tides. Several wharves in this vicinity were carried away and completely wrecked. Great damage was done at Osprey Beach, a summer resort about one mile south of station. All of the cellars in the lower part of New London were flooded. The damage in this vicinity resulting from the storm and high tides is estimated at \$150,000.

Block Island, Rhode Island.—The heaviest sea known for many years accompanied the storm of the 9th (low area iv.). Slight damage was caused by the sea washing over the seawall. Vessels in the harbor dragged anchor, and the United States Coast Survey tide-gauge was completely ruined. The tide ran into Great Pond, which is one hundred and fifty yards from the mean high-tide limit.

New Haven, Connecticut.—The high tides of the 2d flooded the cellars along the wharves in this city. The high easterly winds of the 9th (low area iv.) caused the highest tide that has been observed for many years. The Shore Line railroad at West Haven was two feet under water, and the flooring of the bridge over Oyster river was covered. The Long-wharf road bed was badly washed.

Portland, Maine.—On the 9th the high tides broke completely over the breakwater. Many vessels in the harbor were damaged.

Eastport, Maine.—The heavy sea and high tides of the 10th

caused slight damage to small craft in the harbor. Very high tides also occurred on the 12th, 13th, and 14th.

New York City.—The tides of the 9th were the highest known for many years, and resulted in serious damage along the adjacent coast. The following are estimates of the principal losses sustained: Manhattan Beach Marine railroad, \$70,000; Engeman's Pier, \$10,000; property owners along the beach, from \$6,000 to \$7,000.

Atlantic City, New Jersey.—The storm of the 9th (low area iv.) was accompanied by unusually high tides. Nearly four miles of the coast telegraph line were carried away, and other damage caused along the beach.

Baltimore, Maryland.—The brisk southeast to northeast winds of the 8th caused very high tides.

New River Inlet, North Carolina.—Very high tide and heavy sea occurred on the 8th, cutting away the banks and damaging the coast telegraph line.

Hatteras, North Carolina.—Very high tides were caused by the violent southeasterly gale of the 8th (low area iv.).

Fort Macon, North Carolina.—A strong southeasterly gale prevailed on the 8th (low area iv.), causing the tide to rise to a height of four feet above the mean high-tide point. The coast telegraph line was washed down, cutting off communication.

Cedar Keys, Florida.—High tides occurred on the 1st, 8th, 18th, 24th, and 31st.

#### LOW TIDES.

Galveston, Texas.—The water in Galveston bay was very shallow on the 3d and 24th, owing to "northers."

Indianola, Texas, 8th, 12th, 19th, 20th, 21st.

Cedar Keys, Florida, 8th, 12th, 19th, 20th, 21st.

#### VERIFICATIONS.

##### INDICATIONS.

The detailed comparison of the tri-daily indications for January 1884, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 88.85 per cent. The percentages for the four elements are: weather, 92.26; direction of the wind, 87.03; temperature, 88.65; barometer, 87.14 per cent. By geographical districts they are: for New England, 88.27; middle Atlantic states, 91.73; south Atlantic states, 89.92; eastern Gulf states, 91.31; western Gulf states, 89.49; lower lake region, 88.68; upper lake region, 87.50; Ohio valley and Tennessee, 90.59; upper Mississippi valley, 87.87; Missouri valley, 84.27; north Pacific coast region, 83.04; middle Pacific coast region, 84.48; south Pacific coast region, 83.62. There were sixteen omissions to predict, out of 3,813 or 0.42 per cent. Of the 3,797 predictions that have been made, forty-six, or 1.21 per cent., are considered to have entirely failed; ninety-three, or 2.45 per cent., were one-fourth verified; three hundred and thirty-six, or 8.85 per cent., were one-half verified; five hundred and fifty-nine, or 14.72 per cent., were three-fourths verified; 2,763, or 72.77 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

##### CAUTIONARY SIGNALS.

During January, 1884, two hundred and forty-one cautionary signals were displayed. Of these, two hundred and eight, or 86.31 per cent were justified by winds of twenty-five miles or more, per hour, at or within one hundred miles of the station. Ninety-four cautionary off-shore signals were displayed, of which number, eighty-six, or 91.49 per cent., were justified as to direction, and seventy-seven, or 81.92 per cent., were justified, both as to direction and velocity. One "northwest" signal was ordered (at Milwaukee, Wisconsin), which was justified as to direction and velocity. Three hundred and thirty-six signals of all kinds were displayed, of which two hundred and eighty-six, or 85.12 per cent., were fully justified. These do not include signals ordered at display stations where the wind velocities are only estimated. Ten signals were ordered late. Of the ninety-four cautionary off-shore signals that were displayed, forty-nine were changed from cautionary signals.

In forty-five cases winds of twenty-five miles or more per hours were reported from scattered stations for which no signals had been displayed; in the majority of cases fair weather prevailed; in some, the signals had been lowered too soon. No general storm passed over any district without the display of signals beforehand.

Professor T. C. Mendenhall, director of the "Ohio Meteorological Bureau," in his report for January, states:

Railroad signals during the month of January have been carefully observed at Millersburg, and have been found to be verified both as to temperature and rainfall in 83 per cent. of the predictions. Through the kindness of Mr. Affleck, general ticket agent of the Cleveland, Mount Vernon and Delaware railroad, a considerable number of new "testing stations" have been established, and a more complete report will be made up for the month of February.

The signals above referred to consist of colored symbols displayed from the sides of the baggage cars, representing the daily forecasts, as telegraphed at midnight from the office of the Chief Signal Officer to said bureau.

#### TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors during January, 1884, with the average depth at which the observations were made, and the mean temperature of the air at the various stations, are given in the table below. The highest water temperature reported during the month, 75° 7, was observed at Key West, Florida; the lowest, 29° 5, was reported from Portland, Maine. Observations were interrupted by ice as follows: Boston, Massachusetts, 7th, 8th, 28th; Grand Haven, Michigan, from 3d to 31st; Chincoteague, Virginia, 6th, 7th, 8th; Cleveland, Ohio, from 3d to 31st.

Temperature of water for January, 1884.

STATION.	Temperature at bottom.		Range.	Average depth, feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	42.0	30.0	12.0	ft. 4 in. 9	29.2
Alpena, Michigan*.....					12.7
Augusta, Georgia.....	51.5	36.0	15.5	9 4	43.4
Baltimore, Maryland.....	36.0	30.0	6.0	9 11	32.0
Block Island, Rhode Island.....	39.7	29.8	9.9	8 2	29.5
Boston, Massachusetts.....	31.5	29.7	1.8	22 10	23.3
Buffalo, New York*.....					18.0
Canby, Fort, Washington.....	50.0	37.9	12.1	17 8	42.6
Cedar Keys, Florida.....	68.6	37.5	31.1	11 4	51.6
Charleston, South Carolina.....	56.1	44.3	11.8	40 1	46.6
Chicago, Illinois*.....					19.2
Chincoteague, Virginia.....	44.0	31.3	12.7	5 3	32.7
Cleveland, Ohio.....	32.9	32.1	0.8	14 0	19.3
Detroit, Michigan*.....					21.4
Delaware Breakwater, Delaware.....	41.2	30.8	10.4	8 10	31.1
Duluth, Minnesota*.....					5.3
Eastport, Maine.....	39.3	33.3	6.0	15 11	17.6
Escanaba, Michigan*.....					8.6
Galveston, Texas.....	58.4	37.0	21.4	9 8	46.7
Grand Haven, Michigan.....	32.3	32.0	0.3	19 0	20.9
Indianola, Texas.....	54.5	30.8	23.7	7 9	46.7
Jacksonville, Florida.....	63.5	49.5	14.0	18 0	51.7
Key West, Florida.....	75.7	62.2	13.5	17 8	68.3
Mackinaw City, Michigan*.....					13.0
Marquette, Michigan*.....					10.9
Milwaukee, Wisconsin*.....					13.0
Mobile, Alabama.....	55.3	45.0	10.3	14 2	43.5
New Haven, Connecticut.....	32.1	29.8	2.3	14 3	23.2
New London, Connecticut.....	39.0	33.5	5.5	12 2	26.1
New York City.....	36.3	29.3	6.5	15 11	26.2
Norfolk, Virginia.....	43.5	33.0	10.5	10 2	38.3
Pensacola, Florida.....	59.9	46.6	13.3	16 9	46.4
Portland, Maine.....	32.5	29.5	3.0	16 6	22.4
Portland, Oregon.....	45.4	37.9	7.5	56 3	38.7
Provincetown, Massachusetts.....	37.0	31.0	6.0	11 4	28.5
Sandusky, Ohio.....					20.8
Sandy Hook, New Jersey.....	36.5	34.0	2.5	1 6	27.7
San Francisco, California.....	51.3	49.6	1.7	39 7	50.6
Savannah, Georgia.....	53.3	47.3	6.0	11 7	46.6
Smithville, North Carolina.....	53.4	49.3	13.1	10 0	43.2
Toledo, Ohio*.....					20.0
Wilmington, North Carolina.....	48.7	40.3	8.4	20 10	44.3

\* Frozen the entire month. † Observations interrupted by ice: see text.

#### ATMOSPHERIC ELECTRICITY.

##### AURORAS.

The director of the "Tennessee Weather Service" reports the following:

An aurora was observed at Huntington on the morning of the 21st, and a very brilliant one at Waverly on the 31st.

The only auroral displays reported by the Signal Service observers during the month, occurred on the evenings of the 20th and 25th. The display of the 20th was only observed at Point Judith, Rhode Island, and the observer reports it to have been a faint display lasting from 9.30 p. m. until midnight.

The display of the 25th was observed as follows:

Burlington, Vermont, 25th.—A bright aurora of a pale yellow color, with occasional streamers flashing toward the zenith, from 11.30 p. m. until midnight.

Escanaba, Michigan, 25th.—At 10.15 p. m. an aurora was visible, but cloudiness partially obscured the display. The light was a pale straw color extending upward 25°. No beams were observed.

Fort Buford, Dakota, 25th.—An aurora in the form of "merry dancers" was observed from 9.40 to 11.37 p. m. The display consisted of brilliant white streamers, the outer edges being of a reddish color. The auroral light covered the northern sky from northwest to northeast and to an altitude of 45°.

Poplar River, Montana, 25th.—An auroral light of pale straw color, covering about 45° of the northern horizon, was visible from 9 to 9.25 p. m.

This display was also observed at Cresco and Humboldt, Iowa.

#### ELECTRICAL PHENOMENA.

Huron, Dakota.—An extensive electrical storm prevailed on the 10th. The telegraph lines along the Chicago and Northwestern railroad, both east and west, were operated without battery connection.

Capt. J. E. Dutton, of the s. s. "Sardinian," reports on the 26th, at 12.00 p. m. (Greenwich mean time), between N. 54° 58', W. 17° 46' and N. 55° 17', W. 9° 00', atmospheric electricity visible on the mast-heads, yard-arms, and wire stays.

#### THUNDER-STORMS.

Thunder storms were reported in the various states and territories as follows:

Alabama.—Mobile, 7th.

Arizona.—Fort Apache, 16th, 17th, 18th, 26th; Maricopa, 15th.

Arkansas.—Lead Hill and Little Rock, 30th.

California.—Cape Mendocino, Princeton, and San Francisco, 26th; Hydesville, 26th, 27th; Fall Brook, 28th.

Florida.—Pensacola and Saint Augustine, 7th; Cedar Keys, Jacksonville, Newport, Tallahassee, 24th; Key West, 24th, 25th; Archer, 25th.

Georgia.—Savannah, 8th; Atlanta, 31st.

Illinois.—Cairo, 30th, 31st. During the evening of the 31st brilliant lightning displays were observed near the horizon between west and south. The flashes continued almost incessantly from 6 to 11 p. m.

Indiana.—South Bend, 27th; Fort Wayne, 29th; Griffin Station, Laconia, Logansport, Vevay, and Wabash, 30th.

Iowa.—Burlington, 30th.

Kentucky.—Louisville, 30th.

Louisiana.—Grand Coteau, 7th, 14th; Liberty Hill, 14th.

Michigan.—Hillsdale, Hudson, and Mottville, 30th.

Missouri.—Pierce City, 31st.

North Carolina.—New River Inlet, 1st; Smithville, 1st, 19th; Fort Macon, 8th; Highlands and Ogleeta, 31st.

Ohio.—College Hill and Wauseon, 30th; Jacksonburg, 31st. At Toledo, from 6 to 8 a. m. of the 30th heavy rain showers fell, accompanied by sharp zigzag lightning and heavy peals of thunder. A thunder-storm at this season of the year is of rare occurrence at this place.

Oregon.—Albany, 7th.

Pennsylvania.—Chambersburg, 5th.

South Carolina.—Charleston, 1st, 8th.

Tennessee.—Memphis, 30th, 31st; Ashwood, Chattanooga, Milan and Nashville, 31st.

Wisconsin.—Sussex, 30th.